The Advanced® Micro-Osmometer

Model 3300

User's Guide

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Hot-Line® Service

If you have any questions or problems regarding the proper operation of your instrument, please contact our Hot-Line Service department:

- 800-225-4034 (toll-free within the USA and Canada)
- +US 781-320-9000 (elsewhere)
- 781-320-0811 (fax)

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Parts & Accessories

To order parts and accessories, contact the Advanced Instruments Customer Service Department:

- 800-225-4034 (toll-free within the USA and Canada)
- +US 781-320-9000 (elsewhere)
- 781-320-3669 (fax)

PART DESCRIPTION	PART NO.
20-µL Sampler	3M0825
Replacement Sample Probe	330700
Micro-Sample Test Kit (500 tests)	3MA800
Sampler Plunger Wires (2)	3M0828
Thermal Printer with Interface Cable, Operation Manual, Thermal Paper Roll, and Printer Power Supply (100-120 VAC)	210555_NA
Thermal Printer with Interface Cable, Operation Manual, Thermal Paper Roll, and Printer Power Supply (230 VAC)	210555_EU
Printer Paper (5 rolls)	3D3835
User's Guide	3305
Service Manual	3305SM
Serial Cable	RS232-Cable
Software Upgrade*	330990
Barcode Scanner	330016

* Note: 330990 upgrade kit comes with a 3-meter serial cable #330053.

Notes:

Calibrators & Standards

To order calibrators and standards, contact the Advanced Instruments Customer Service Department:

- 800-225-4034 (toll-free within the USA and Canada)
- +US 781-320-9000 (elsewhere)
- 781-320-3669 (fax)

DESCRIPTION	PART NO.
Clinitrol™ Reference Solution (10 2-mL ampules)	3MA029
Protinol® 3-Level Protein Control Kit (9 3-mL bottles, 3 of each level)	3MA028
Renol™ Urine Osmolality Controls (2 levels)	3LA085
5-Value Osmolality Linearity Set (10 5-mL ampules, 2 of each value)	3LA028
50 mOsm/kg Calibration Standard (10 2-mL ampules)	3MA005
850 mOsm/kg Calibration Standard (10 2-mL ampules)	3MA085

Notes:

Safe Use

To reduce the risk of bodily injury, electric shock, fire, and damage to your instrument, please read and observe the precautions in this User's Guide.

- If the product is used in a manner not in accordance with the equipment design, operating instructions or manufacturer's recommendations, the operation of the product may be impaired to the extent that a safety hazard is created.
- Do not attempt to perform electrical work if you are not fully qualified. This manual is not a substitute for electrical training.

Symbol conventions

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying this product.

The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated dangerous voltage within the product's enclosure that may be of sufficient magnitude to constitute risk of electric shock to persons.

The static symbol within an equilateral triangle is intended to alert the user to the presence of internal components that could be damaged by static electricity.

This static symbol is intended to alert the user to the presence of a specific component that could be damaged by static electricity.

This symbol indicates the presence of alternating current (AC).

This symbol indicates the presence of a fuse.

This symbol indicates the presence of protective earth ground.

General cautions

- This product should be operated only with the type of power source indicated on the product's electrical ratings label. Refer to the installation instructions included with the product.
- If the power cord provided is replaced for any reason or if an alternate cord is used, the cord must be approved for use in the local country. The power cord must be approved for the product's listed operating voltage and be rated at least 20% greater than the ampere ratings marked on the product's electrical ratings label. The cord end that connects to the product must have an IEC 60320 connector.
- Plug the product into an approved grounded electrical outlet.
- Do not disable the power cord's grounding plug.
- If an extension cord or power strip is used, make sure that the cord or strip is rated for the product, and that the total ampere ratings of all products plugged into the extension cord or strip do not exceed 80% of the cord's or strip's rating limit.
- Route power cords so that they will not be walked on, tripped on, or pinched by items placed upon or against them. Pay particular attention to the plug, electrical outlet, and the point where the cord exits the product.
- Do not pull on cords and cables. When unplugging cords or cables, grasp the corresponding connector.

- Do not install or use this product in any area subject to extreme short-term temperature variations, or locations that exceed the specified operating environment temperatures.
- Never use this product in a wet area.
- To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.
- Do not install or use the product on an unstable, non-level work surface.
- Do not operate this product with the covers removed or unsecured.

Notes:

Foreword

Intended Use

Advanced® Osmometers use the technique of freezing-point depression to measure osmolality. Osmolality is the total solute concentration of an aqueous solution. Osmometers measure the number of solute particles irrespective of molecular weight or ionic charge. This information is useful to the following disciplines:

- Clinical, emergency and sports medicine
- Medical research
- Biotechnology and pharmaceutical research and manufacturing
- Food and beverage manufacturing
- Environmental research and monitoring
- Academic research
- Industrial applications

When used by a trained operator in clinical applications, the osmometer provides results that assist in establishing the proper diagnoses and treatments for patients with disorders involving water and electrolyte imbalances. Osmometers will test virtually any biological fluid including, but not limited to, whole blood, plasma, urine, feces, sweat, and tissue homogenate. Operation of the instrument is deemed to be low-complexity under CLIA and FDA guidelines.

Principles of Freezing-Point Osmometry

When a solute is dissolved in a pure solvent, the following changes in the solution's properties occur:

- the freezing point is depressed,
- boiling point is raised,
- osmotic pressure is increased, and
- vapor pressure is lowered.

These are the so-called "colligative" or concentrative properties of the solution which, within reasonable limits, change in direct proportion to the solute concentration; in other words, the number of particles in solution.

Of the colligative properties, measurement of the freezing point allows the concentration of an aqueous solution to be easily determined with great precision.

The freezing point of pure H_2O is precisely +0.010°C. One mole of a non-dissociating solute such as glucose (where the solute does not dissociate into ionic species, but remains intact), when dissolved in 1 kilogram (kg) of water will depress the freezing point by 1.858°C. This change is known as the freezing point depression constant for water. The freezing point depression also depends upon the degree of dissociation of the solute. If the solute is ionic, the freezing point is depressed by 1.858°C for each ionic species. For example, if one mole of sodium chloride were to completely dissociate into two ionic species (Na+ and Cl-) in 1 kg of water, the freezing point would be depressed by 3.716°C. However, dissociation is never complete. Interference between solute molecules reduces dissociation by a factor called the osmotic coefficient.

In a simple solution such as glucose or sodium chloride in water, the freezing point can be measured and the unit concentration easily determined from an equation or a reference table. However, the equation is unique for each solute. In a more complex solution, all ionized and non-dissociated species contribute to the freezing-point depression and the concentration of each solute cannot be easily determined.

Each of the colligative properties has a similar problem, and though each of the colligative properties changes in direct proportion to the solute concentration, each requires a different mode & unit of measurement. Osmolality is a common unit of concentration measurement that can be used to relate all the colligative properties to each other, and to other concentration units. Because of its universality, most osmometry applications regularly use osmolality, expressed as "mOsm/kg H_2O", as the common unit of concentration rather than applying further conversion factors.

Instrumentation

Advanced Osmometers are devices for the determination of the concentration of solutions by means of freezing-point measurement.

Advanced Osmometers utilize high-precision thermometers to sense the sample temperature, to control the degree of supercooling and freeze induction, and to measure the freezing point of the sample. They can routinely determine differences of ±1 mOsm/kg H_2O.

Freezing-Point Thermodynamics

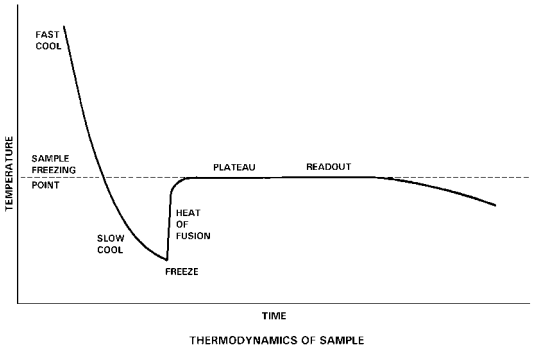
The quickest and most precise way to measure the freezing point of a solution is to supercool it several degrees below its freezing point. It is unstable in this state, and a mechanical agitation induces crystallization. The heat of fusion suddenly liberated causes the sample temperature to rise toward a plateau temperature, where a liquid/solid equilibrium occurs. The equilibrium temperature is, by definition, the freezing point

of the solution. Managing the plateau temperature for precise measurement is the basis for several patents issued to Augustus Fiske.

The time over which liquid/solid equilibrium develops and is maintained, is a function of the speed with which the heat-of-fusion is liberated vs. the speed it is transferred away, or absorbed, by the surrounding environment. This ratio can be slowed and the equilibrium time stretched, to give a distinct plateau height measurable to 0.001°C.

Sensitive thermistor probes monitor the sample temperature and control the thermoelectric cooling element. Microprocessor control and automated operation minimize imprecision due to operator technique.

The following Standard Freezing Curve illustrates the temperature of a sample as it progresses through the freezing cycle and shows the action of the instrument at each stage of the cycle.



Standard Freezing Curve

Definitions

Solution: A homogeneous mixture of solute and solvent in which the solvent is usually the major component, and the solute is the minor component.

Concentration: The ratio of solute to a given amount of solvent (molal), or ratio of solute to solution (molar).

The amount of solute is usually expressed in terms of moles, i.e., gram molecular weights. One mole = 6.028 x 10^{23} molecules (Avogadro's number). One mole of glucose (180.2 g) and one mole of sodium chloride (58.4 g) each contain Avogadro's number of molecules.

Common units of concentration are:

- **Molality**: Moles of solute per kilogram of pure solvent.

- **Osmolality**: Osmols of solute particles per kilogram of pure solvent. As noted above, most ionic solutes do not completely dissociate. Osmolality is a unit of concentration that takes into account the dissociative effect. Osmolality is usually expressed in mOsm/kg H_2O. One milliosmol (mOsm) is 10^{-3} osmols. Osmolality is defined as:

$$Osmolality = \phi nC = \frac{osmol}{kg\ H_2O}$$

  where:
  ϕ = osmotic coefficient, which accounts for the degree of molecular dissociation.
  n = number of particles into which a molecule can dissociate.
  C = molal concentration of the solution.

- **Molarity**: Moles of solute per liter of solution.

- **Osmolarity**: Osmols of solute particles per liter of solution. Although molarity and osmolarity may be common units of measurement in other branches of chemistry, they are not used in osmometry because the ratio of solute to solution is not linear. Molality and osmolality are linear, independent of the effect of temperature and volume displaced by solute. A calculated conversion between units of molality and molarity is complex and generally unnecessary when the terms are properly understood.

Freezing Point/Melting Point: The temperature at which the liquid and solid phases of a substance will remain together in equilibrium.

Freezing-Point Depression: When a solute is added to a solvent, the freezing point of the solvent is lowered. In aqueous solutions, one mOsm of solute per kilogram of water depresses the freezing point by 1.858 millidegrees Celsius (m°C).

Supercooling: The tendency of a substance to remain in the liquid state when cooled below its freezing point.

Crystallization Temperature: Aqueous solutions can be induced to freeze (i.e., crystallize) most reliably when supercooled. When supercooled, agitating the solution (freeze pulse) induces crystal formation. The crystallization temperature is the temperature at which crystallization is induced. During crystallization, the heat of fusion raises the temperature of the sample to an ice/water freezing-point plateau.

Heat of Fusion: The heat released when the mobile molecules of a liquid are frozen into rigid ice crystals.

Freezing-Point Plateau: The constant temperature maintained during the time that ice and liquid exist in isothermal equilibrium after crystallization occurs.

1 Installation & Setup

In order to set up your instrument properly, it is important that you read and follow the steps in this section. Please follow these steps carefully and be sure to read ***Chapter 2 — Instrument Operation*** *before attempting to run tests on your instrument.*

Step 1 — Find a location for your instrument

When choosing a location for your new osmometer, be sure to meet the following criteria.

- **Adequate space.** The dimensions of the instrument are 13 × 10.5 × 15.5 inches (26.7 × 33 × 39.4 cm). Be sure to keep your workplace free of debris, especially near the front of the instrument where proper ventilation is needed.

- **Electric outlet availability.** Your instrument will need to operate within five feet of a properly grounded, three-prong electrical outlet capable of continuously supplying 1 ampere at 200-250V to 1.25 amperes at 100-130V. If the instrument is not grounded properly, its operation may be impaired and a safety hazard may exist. Therefore, be sure to test the outlet and record the results before operating your instrument.

Step 2 — Unpack your instrument

To unpack your osmometer, take the following steps.

a. Carefully unpack your osmometer, accessories and supplies and inspect them for shipping damage. Use the enclosed packing list to verify that all items have been received.

b. Save your osmometer's shipping boxes and packaging material in case future transport of the instrument becomes necessary.

c. If any item on the packing list appears to be missing from your shipment, please search carefully through and under all packing materials. If the item is not found, notify your receiving department immediately. Advanced Instruments can only be responsible for items reported missing within 10 days of a shipment's arrival.

d. If you receive any damaged items, save the cartons and packing material those items came in for inspection by the insurer. The carrier, dealer, and Advanced Instruments must be notified within 24 hours in order for your warranty and insurance to apply. Have the transportation company inspect items, fill out a "Report of Concealed Damage," and file your claim. Then, notify Advanced Instruments immediately for repair or replacement.

e. Fill out the postage-paid "(U.S.A. Only)" warranty card enclosed. Mark the appropriate boxes if you wish to receive additional information. Customers outside of the United States may fax the warranty card to 781-320-8181.

Step 3 — Obtain additional items

Soft, no-lint, non-ionic paper tissues are needed for wiping the sample cells prior to testing. Please be sure that you have an adequate supply on hand before attempting to run tests on your instrument.

Step 4 — Power up your instrument

Turn your instrument on by pushing the rocker-style power switch on the instrument's back panel into the on (|) position.

Each time your instrument is turned on, it automatically runs a one-minute setup and self-diagnostic program. During these diagnostics, your display and printer (if in use) display critical instrument information, such as software version and block and sample probe bin numbers. The first time you power up your osmometer, record the software revision and

Figure 1: Model 3300 Micro-Osmometer and Accessories

Quantity	Part No.	Description
1	3300	The Advanced® Model 3300 Micro-Osmometer
1 pack	3MA029	Clinitrol™ 290 mOsm/kg Reference Solution (ten 2 mL ampules)
1 pack	3MA005	50 mOsm/kg Calibration Standard (ten 2 mL ampules)
1 pack	3MA085	850 mOsm/kg Calibration Standard (ten 2 mL ampules)
1 kit	3MA800	Micro-Sample Kit: includes 500 disposable sample cells (tips) and 500 chamber cleaners
2	3D3185	Operator/Supervisor Keys
1	3MO825	20-µL Sampler
1	———	Power Cord (as specified)
1	90P01	Advanced® User Information CD-ROM
1	3305	User's Guide
1	3305-6	Warranty Card
1	3D3P021	Customer Satisfaction Card

Table 1: Model 3300 Micro-Osmometer Packing List

block and sample probe bin numbers in the Service Log at the end of this user's guide. Maintaining a record of this information will facilitate any necessary service.

When the self-diagnostics have been completed and the instrument is ready for testing, the display reads "**Osmometer Ready**".

NOTE To avoid any misunderstanding that might arise due to an unfamiliar display language, all displayed messages may be changed from English to several other languages. (For language selection instructions, see Chapter 2.)

CAUTION If a power interruption occurs, turn the instrument off at once. Leave it turned off for at least 5 seconds after power has been restored (even if power restoration is immediate).

Step 5 — Set your date and time

If you wish, you may now change your date and time settings by using the instructions found on page 17 of this user's guide.

Step 6 — Check your initial calibration

Your instrument has been carefully calibrated by the manufacturer, but to verify that this calibration is accurate within your operating environment, run tests on the 290 mOsm/kg reference solution and/or Protinol® biological controls before testing samples. The number and type of tests that you run should be determined by your own laboratory's standard protocol. Use the operating technique described in Chapter 2 when running these controls.

If you determine that the initial calibration is incorrect, re-calibrate as described in Chapter 3.

NOTE If your Model 3300 has just been moved from a different location, it should be allowed to warm up for 20 to 30 minutes before you run calibration verification tests.

Step 7 — Proceed to instrument operation

If you have followed the steps outlined in this chapter, your instrument is ready for use. To learn how to operate your instrument, read the next chapter, “Instrument Operation”. We strongly recommend that you read the entire second chapter before attempting to operate your osmometer.

Notes:

2 Instrument Operation

In order to run your instrument properly, it is important that you read and adhere to the instructions in this section. For information on calibration, see ***Chapter 3 — Calibration.***

Hazardous material cautions

- **WARNING**: Handle all biohazardous materials according to established good laboratory practices and follow your institution's exposure control plan. Persons handling human blood and body fluid samples must be trained in blood-borne hazards and observe universal precautions. Universal precautions is an approach to infection control, where all human blood and body fluids are treated as if known to be infectious. Use personal protective equipment such as gloves, gowns, etc., to prevent exposure. Store biohazardous materials in regulated waste containers and dispose of these materials in a safe and acceptable manner that is in compliance with all country, state and local requirements.
- If a biohazardous material is spilled on or inside the equipment, decontaminate the equipment using a 1% bleach solution, or as outlined by those policies and procedures established within your institution.
- To avoid injury or fire hazard, do not operate this product in an explosive atmosphere.

Function of major components

The major components of the Model 3300 Micro-Osmometer are an operating cradle; a sample port to precisely position each sample for the osmolality test; a high-precision thermistor

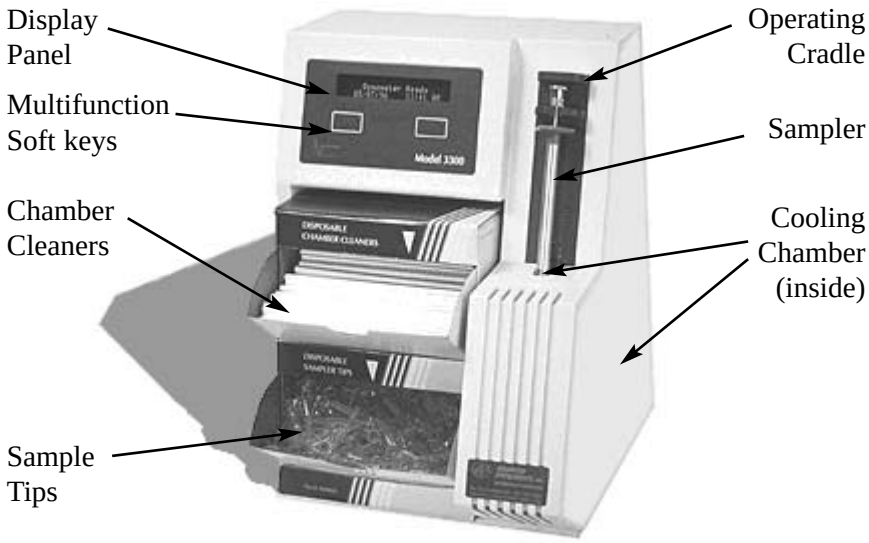


Figure 2: Model 3300 Components and Controls

probe; measurement and control circuitry; and a message display panel. A sample handling pipette is also used in the testing process. The function of many of these parts is described below.

Electronic circuits (inside)

The main circuitry is contained on two printed circuit boards in a motherboard/daughterboard configuration. More in-depth technical details are available in the unit service manual, sold separately.

Processor Board: The processor board is the smaller of the two printed circuit boards and contains the Intel 80C186EB central processor, two flash EPROM's, RAM, Realtime clock, watchdog circuit, and glue logic.

Application Board: The application board contains the circuits for controlling and interfacing with the other subsystems such as the keypad, display, cooling assembly, RS-232, printer and barcode ports, etc. The application board also contains two 20-bit A/D converters for reading the sample and block probe thermistors.

Sampler (Figure 2)

The sampler is a specialized pipette which contains and positions a very specific volume of sample for each test. The sampler consists of the pipette body and disposable plastic sample tip that must be replaced after each test.

Operating cradle (Figure 2)

The operating cradle is a sliding mechanism that guides and introduces the sampler to the freezing chamber.

Cooling chamber & measurement and control circuits:

A high-reliability thermoelectric module controls cooling chamber temperature, while a thermistor sample probe measures the dynamic temperature of a sample. Test results, based on the freezing point of the sample, are automatically sent to the instrument's display.

Display panel (Figure 2)

The display panel displays:

- Test status and results.
- Status messages when the instrument is turned on or when functions are selected.
- Pertinent error messages when fault conditions occur. (Messages longer than 24 characters wrap to the second line.)

Multifunction soft keys (Figure 2)

Other than starting osmolality tests, which are initiated by the operating cradle, all operator communication to the Model 3300 is accomplished by means of the two multifunction soft keys.

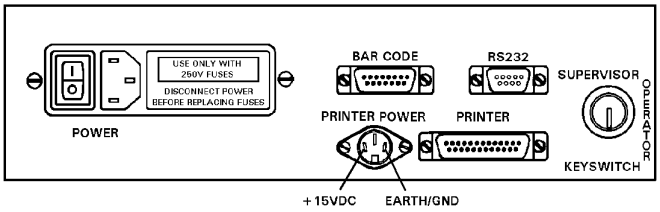


Figure 3: Model 3300 Back Panel

Power module (Figure 3)

The power module on the rear of the instrument contains the following components.

- *Power switch*
  The rocker-style power switch controls the power to the instrument.
- *Power cord connector*
  The power cord connector accommodates a power cord suitable for the power available.
- *Fuse holder & fuses*
  The fuse holder contains the instrument's necessary fuses. For instructions on replacing fuses, see Chapter 4.

Printer port (Figure 3)

The printer port on the rear panel allows you to use a printer in conjunction with this instrument. For instructions on using a printer with this instrument, see "Using a printer with the Model 3300" in this chapter.

RS-232 port (Figure 3)

The RS-232 port allows you to output your instrument's data/messages to an external device, such as a computer, and to upgrade your instrument software. For more detailed information dealing with the RS-232 port, please read the sections titled "Using the Model 3300's RS-232 Port" and "Instrument Software Update", found later in this chapter.

Barcode port (Figure 3)

A D-type, 15-pin barcode port is provided in the back of the 3300 for connecting and providing power to such a device. For proper operation, the barcode port requires a 1200 bps, RS232-level signal providing asynchronous serial data containing 1 start bit, 8 data bits, 1 stop bit and no parity.

Signal	Pin	Direction
+5V DC	1	to reader
receive data	10	from reader
gnd/earth	9	common

Table 2: Barcode Port Connections

A suitable RS232 barcode scanner is available from Advanced Instruments, Inc. To interface with the 3300, the barcode scanner must be programmed as follows, referring to the scanner users guide.

10 msec Intercharacter Delay
Disable Line Feed Suffix
No Parity
1200 BAUD Rate
8 Data Bits

Supervisor/operator keyswitch (Figure 3)

The supervisor/operator keyswitch allows certain instrument functions to be locked. The Supervisor keyswitch position is required for re-calibration and for access to the following diagnostic menu items: Set Probe Bin #s, Set Serial Rate, Serial Comm Set and Select Language.

If a restricted function is attempted while Supervisor/Operator keyswitch is in the operator position, a "**Supervisor Key Needed**" message is displayed and may be cleared by pressing both function buttons simultaneously before selecting any other function.

To utilize the supervisor/operator keyswitch you **must** use the key supplied with your instrument.

Sample handling

The sampling system kit supplied with your Model 3300 contains a special sampler and a starter supply of disposable sample cells and chamber cleaners. Each kit contains re-order information.

Be sure to replace the sampler plunger with each new test kit (500 samples). For instructions on this procedure, see "Sample plunger replacement and verification" in Chapter 4.

The Model 3300 measures the osmolality of a sample inside the sample cell while on the pipette. This feature requires sample cells specially designed to match both the sampler and the Model 3300. Do not use any other sample-handling system with your Model 3300 osmometer, and do not use the Model 3300 sampling system with any other laboratory procedure.

Standards & controls

Advanced Instruments offers and recommends the use of specific standards and controls with your Model 3300 osmometer. Each type may be used to assess a different aspect of your instrument's performance. For information on obtaining these standards and controls, contact Advanced Instruments or an authorized representative.

Clinitrol 290 Reference Solution (Part No. 3MA029)

We recommend that you run samples of Clinitrol 290 Reference Solution daily to check your instrument operation and confirm your calibration. You should also run the Clinitrol 290 Reference Solution when you receive erratic results. Doing so will allow you to verify proper operation or recognize and diagnose problems promptly.

Protinol (Part No. 3MA028)

Advanced Protinol protein-based controls, at 240, 280 and 320 mOsm (±5 mOsm), provide control values that closely bracket those of most serum samples. These controls are formulated to mimic the freezing characteristics of actual serum samples, and they can be used to verify

the precision and reliability of your osmometer results. Protinol should be used once every shift.

Advanced Five-Level Linearity Set (Part No. 3LA028)

The Advanced Linearity Set contains five controls (100, 500, 900, 1500, and 2000 mOsm). Use this set to verify or establish the reportable range of patient test results.

Sample test procedure

Use the following procedure to run sample tests.

1. Snap a sample tip into place on the sampler. The sample cell must be straight and firmly seated. Be careful not to crack the sample tip.
2. Depress the sampler's plunger and insert the sample tip at least ¼ inch (6 mm) below the surface of the fluid to be tested. Gently release the plunger to load a 20-µL sample.
3. Visually inspect the sample. If there are any large voids or bubbles in the sample, expel the sample and load a bubble-free sample.
4. Blot the sides of the loaded sample cell with a soft, no-lint, non-ionic paper tissue to remove any clinging droplets. Then blot the end of the cell tip to remove any fluid protruding beyond the tip. Be careful not to wick out any of the sample. The meniscus remaining may be

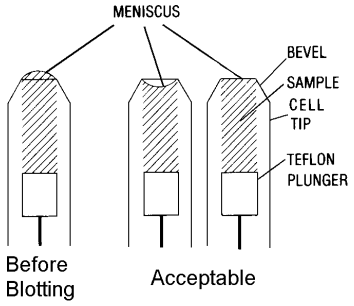


Figure 4: Sample Cell Tips and Sample Levels

slightly concave, but the sample must be slightly longer than it is wide. (See **figure 4.**)

5. Remove the chamber cleaner from the sample port and discard.
6. Holding the sampler by the barrel and letting the filled sample tip follow the guide groove into the sample port, rest the sampler within the operating cradle and beneath the cradle top.
7. To start the test, push the entire operating cradle down until it reaches a positive stop. Your instrument will run the test for approximately one minute and display the result in the format "**Osmolality xxx mOsm**".
8. Record the results and raise the operating cradle to a positive stop.
9. Remove the sampler from the operating cradle.
10. Insert a clean, dry chamber cleaner into the sample port and rotate it four or five times in both a clockwise and counterclockwise direction. Withdraw chamber cleaner and insert the opposite end. Rotate the chamber cleaner in the same manner and leave it in the sample port until your next test.
11. Remove the used sample tip from the sampler by pressing firmly enough on the sampler plunger to dislodge the tip. Discard the used sample tip.
12. Blot the Teflon plunger tip with a soft, no-lint, non-ionic paper tissue. Be careful not to dislodge the tip.
13. To run additional tests, repeat this procedure beginning with step 1.

Sample test errors

Occasionally a test will not run to completion and your instrument will display an error message. Refer to the Troubleshooting Table appendix at the end of this user's guide for an explanation of a particular message.

Repeatability Tips

- Treat all samples, as well as standards and reference solutions, uniformly before the test.
- Microsamples are more susceptible to contamination and evaporation than larger samples. Avoid leaving sample containers open. Cold samples are susceptible to condensation; warmer samples are susceptible to evaporation.
- Use only the Advanced Model 3300 sampling system. Each system comes with specific operating instructions and re-order information.
- If an occasional sample produces irregular results, discard obviously discrepant readings as long as the instrument has been producing accurate readings repeatedly. Repeat the sample in question.
- For repeat runs, use additional samples from the same source.
- Keep the cooling chamber clean between tests. Never inject anything into the cooling chamber.

Recall results

The recall results feature of the Model 3300 allows you display or print the results of your last 30 tests. If you need to see any or all of these results, take the following steps.

1. At "**Osmometer Ready**", the two multifunction soft keys are labeled **[CALIB]** and **[DIAG]**, respectively. Press the soft key labeled **[DIAG]** to enter the diagnostic test menu.
2. While you are within the diagnostic test menu, the soft key labels will change to **[START]** and **[INDEX]**. Use the **[INDEX]** keypad to cycle through your choices until you see "**1. Recall Results**".

3. Press **[START]** to enter the recall results mode. Your instrument will display the data of the most recent test result.
4. Press the right soft key to see the result of the next-to-last test result.
5. Continue in this manner until you have recalled the necessary results.
6. To return to the diagnostic menu, press the two soft keys simultaneously.
7. To return to "**Osmometer Ready**", again press the two function keypads simultaneously.

Statistics

The statistics option allows you to recall the stored results from a selected last number of tests stored in the recall buffer and calculate their average, standard deviation and coefficient of variance. If any test errors are stored in the range you select, they will be filtered out of the calculations. To use this option, follow this procedure:

1. At "**Osmometer Ready**", the two multifunction soft keys are labeled **[CALIB]** and **[DIAG]**, respectively. Press the soft key labeled **[DIAG]** to enter the diagnostic test menu.
2. While you are within the diagnostic test menu, the soft key labels will change to **[START]** and **[INDEX]**. Use the **[INDEX]** soft key to cycle through your choices until you see "**2. Statistics**".
3. Press **[START]** to enter the statistics mode. Your instrument will display the number of tests to be considered when computing statistics.
4. Press the right **[INDEX]** soft key to index to the number of results that you wish to consider.

   NOTE If you request calculations for more samples than are stored in the recall buffer, you will receive incorrect results.

5. Press the left **[START]** soft key to display and print (if using external printer or serial port) the average of the selected number of last results.

6. Press the left **[START]** soft key again to display and print the standard deviation of the selected number of last results.
7. Press the left **[START]** soft key a third time to display and print the coefficient of variance of the selected number of last results.
8. To return to the diagnostic menu, press the two multifunction soft keys simultaneously.
9. To return to "**Osmometer Ready**", again press the two function keypads simultaneously.

Changing operating settings

Date and time

To reset the date and time, take the following steps:

1. At "**Osmometer Ready**", the two multifunction soft keys are labeled **[CALIB]** and **[DIAG]**, respectively. Press the soft key labeled **[DIAG]** to enter the diagnostic test menu.
2. While you are within the diagnostic test menu, the soft key labels will change to **[START]** and **[INDEX]**. Use the **[INDEX]** soft key to cycle through your choices until you see "**13. Set Date/Time**".
3. Press **[START]** to enter the Set Date/Time mode. Your instrument will display the current date and time.
4. Press the left soft key to select the date or the right soft key to select the time.
5. If you choose to set the date:
   a) Select between **DD/MM/YYYY** and **MM/DD/YYYY** formats. Your instrument will display the current date in the format you selected and a blinking cursor element.
   b) Use the left soft key to increment the number at the cursor and the right soft key to change between digits in the date until the correct date is displayed.

c) Press both soft key buttons to save the new date setting and return to the diagnostic test menu.

6. If you choose to set the time

   a) Select between **AM/PM** and **24-hour** formats. After you select a display format, your instrument will display the current time in the selected format.

   b) Use the right keypad to toggle between hours and minutes and the left keypad to change the number of hours or minutes displayed.

   c) Press both soft key buttons to save the new time setting and return to the diagnostic test menu.

Set Probe Bin #'s

To reset the block and sample probe bin numbers, take the following steps:

1. At "**Osmometer Ready**", the two multifunction soft keys are labeled **[CALIB]** and **[DIAG]**, respectively. Press the soft key labeled **[DIAG]** to enter the diagnostic test menu.
2. While you are within the diagnostic test menu, the soft key labels will change to **[START]** and **[INDEX]**. Use the **[INDEX]** soft key to cycle through your choices until you see "**3. Set Probe Bin #'s**".
3. Press **[START]** to enter the selection menu.
4. Press the right [**INDEX**] soft key to advance the probe bin #, or press the left [**NEXT**] soft key to advance to the next probe bin #.

   Be sure to record the new bin settings in the Service Log at the back of this user's guide.

5. Press [**NEXT**] soft key to advance to the save options.
6. Select [**YES**] to save the new setting, or [**NO**] if no change was made.

Data Capture

To change the RS-232 output between standard mode and capture mode, take the following steps:

NOTE With Capture selected, freezing curve output data will be presented to the serial port in real time. This data is updated every 50 msec after crossing 0ºC, and may be captured with any RS-232 compatible computer program for use in plotting freezing curves.

In Standard mode, ony the final result and some status messages will be presented to the serial port.

1. At "**Osmometer Ready**", the two multifunction soft keys are labeled **[CALIB]** and **[DIAG]**, respectively. Press the soft key labeled **[DIAG]** to enter the diagnostic test menu.
2. While you are within the diagnostic test menu, the soft key labels will change to **[START]** and **[INDEX]**. Use the **[INDEX]** soft key to cycle through your choices until you see "**12. Data Capture**".
3. Press **[START]** to enter the selection menu.
4. Select the soft key for the mode you want to use.
5. Press the two soft keys simultaneously to lock in your selection.
6. Press the two soft keys again simultaneously to return to "**Osmometer Ready**".

Language

To reset the display language, take the following steps:

1. At "**Osmometer Ready**", the two multifunction soft keys are labeled **[CALIB]** and **[DIAG]**, respectively. Press the soft key labeled **[DIAG]** to enter the diagnostic test menu.
2. While you are within the diagnostic test menu, the soft key labels will change to [**START]** and **[INDEX]**. Use the **[INDEX]** keypad to cycle through your choices until you see "**14. Select Language**".

3. Press **[START]** to enter the Select Language mode. Your instrument will display the currently set language.
4. Press the left soft key to switch between languages.
5. To lock in the selected language and return to the diagnostic menu, press the two soft keys simultaneously.
6. Press the two soft keys again simultaneously to return to "**Osmometer Ready**".

Using a barcode scanner (Part # 330016) with the Model 3300

The barcode option provides a means of entering an identification code with an **internally decoding barcode scanner** connected to the barcode port. To interface with the Model 3300, the barcode scanner must be programmed as follows, referring to the scanner users guide:

10 msec Intercharacter Delay
Disable Line Feed Suffix
No Parity
1200 BAUD Rate
8 Data Bits

When the barcode scanner (part # 330016) is connected to the Model 3300, the instrument operator may scan an identifying barcode before introducing a sample.

NOTE The barcode configuration may work with many different scanners, but not all are recommended and supported by Advanced Instruments. For information on which scanners are supported by Advanced Instruments, please contact Advanced Instruments customer service department.

NOTE To avoid possible damage to your instrument or the barcode scanner, turn off the instrument power before connecting to the barcode port.

If you introduce a sample without a prior barcode scan, the test results will display without further identification. If you scan a barcode, the Model 3300 will display "**Successful Scan [Cancel]**" on the first line and the decoded barcode on the second line. During that display, the instrument operator may introduce a sample for test and identification with the decoded barcode or may cancel and either re-scan or introduce a sample without barcode identification.

Using a printer with the Model 3300

The 25-pin output printer port on the back of the Model 3300 allows the use of most standard printers. For information on ordering a compatible printer, contact the Customer Service Department at Advanced Instruments. See page v for ordering information.

The use of a printer cable and/or printer power cable other than supplied by Advanced Instruments may result in excessive electromagnetic noise and unintended interference with other devices.

Using the Model 3300's RS-232 port

The RS-232 port allows you to output to an external device, such as a computer, and to update your instrument software. Almost every item of information displayed by your instrument is also transmitted over the RS-232 port, including test results, all error messages, and most display data from the diagnostic menu.

The default serial data rate for communications is 9600 bps (bits per second), though you may alternatively select 1200, 2400, 4800, and 19200 bps.

The DB-9 RS-232 port on your instrument conforms to the DTE EIA-232 standard and can reliably communicate over shielded cable up to 10 meters in length, depending on the baud rate you use.

Note Your instrument is only designed to support unidirectional communication with an external device. At this time, there is no protocol for bidirectional communication.

For a sample RS-232 Port Setup, please see the Supplemental RS-232 Information Appendix at the end of this user's guide.

Instrument software update

Your instrument software contained in two flash EPROMs on the main processor board may be updated via the RS-232 port. Such software updates are made available as new features and other improvements are added during the life cycle of the instrument. For information on the availability of software updates contact Advanced Instruments, Inc. or an authorized distributor (see Chapter 4, page **29**). For directions on performing the RS-232 serial port software upgrade consult the documentation supplied with the upgrade package.

3 Calibration

This chapter describes the procedure for calibrating your instrument. If you have questions or problems regarding the calibration procedure, please consult ***Chapter 4 — Troubleshooting & Service****.*

Calibration procedure

Calibration of the Model 3300 is a simple procedure that requires no adjustment of the instrument by the user. Simply run the menu-driven calibration program requiring the testing of standards at each of two calibration points. If the repeatability is acceptable on these calibration points, the instrument automatically performs internal calibration.

The calibration procedure is as follows. Note that maintaining and loading accurate, uncontaminated standard samples is extremely important.

1. At "**Osmometer Ready**," press the left soft key, labeled **[CALIB]** to initiate the calibration process. The calibration program will prompt you to run a sample of the 50 mOsm calibration standard.
2. Run the 50 mOsm calibration standard as you would an actual sample (see Chapter 2 — Operation). When the instrument completes each test and reports the results (not necessarily the exact standard value), raise the operating cradle, remove the sampler, and clean the chamber as recommended in Chapter 2.

3. The calibration program will prompt you for a second 50 mOsm calibration standard. Run the second 50 mOsm calibration standard. When the test finishes, your instrument will display a result and prompt you for an 850 mOsm calibration standard.
4. Run your first 850 mOsm calibration standard as described above. The program will report a result and request another 850 mOsm calibration standard. Continue in this manner until the instrument display reads "Calibration complete". The program can require anywhere between three and six 850 standard samples, depending on the repeatability of the results.
5. Verify the calibration by running a Clinitrol 290 reference solution before running unknown samples.

If the instrument display shows "**Calibration Not Complete**" after six samples at either calibration level, the calibration procedure has failed and you should carefully repeat the procedure. If you experience "**Calibration Not Complete**" more than once, you have a repeatability problem and should consult Chapter 4 for troubleshooting and service information.

Calibration notes

- The Model 3300 will retain its previous calibration data until it completes a re-calibration and the display reads "**Calibration Complete**".
- If the instrument has calibration information in memory and you have not changed any probes, the first test result displayed should be close to the nominal value of the standard loaded. If the instrument has no calibration information in memory or a probe has been changed, the test result displayed may be far from the nominal value of the standard loaded. If the displayed values repeat consistently, the calibration will automatically adjust when the calibration test sequence is complete.

- You may terminate the calibration procedure at any time by raising the operating cradle and pressing **[CANCEL]**. The Model 3300 will display "**Test Canceled**", beep once, then display "**Calib. Canceled**" and beep again. The existing calibration will not be affected.
- If you accidentally press a function soft key during a series of regular tests, the same procedure will terminate the calibrate mode without affecting the calibration and normal testing may be continued.

Notes:

4 Troubleshooting & Service

This chapter contains very basic information to help you solve problems that might arise with your osmometer. Please read all instructions very carefully, and if a solution cannot be found in this guide, contact Advanced Instruments for Hot-Line Service.

Service & maintenance cautions

- Do not perform any service or maintenance yourself, except as detailed in the User's Guide.
- Unplug the power cord prior to opening or removing covers, or else you may be exposed to electric shock, excessive temperatures, or mechanical hazards.
- Performing service or maintenance not detailed in the User's Guide, with or without a Service Manual, should only be done by a qualified service technician.
- Never restrict airflow into or out of the product. Occasionally, check the air vents for blockage.
- Wipe the exterior of the product with a soft, damp cloth as needed. Using cleaning products other than those specified, may discolor or damage the finish.
- If the product requires service for any of the following reasons, unplug the product from the electrical outlet and refer service to a qualified service technician.
    - The power cord, extension cord, power strip, or power input module is damaged.

- Liquid has been spilled into the interior of the product.
- A foreign object has fallen into the product.
- The product has been dropped or damaged by a falling object.
- There are noticeable signs of overheating or a burning odor.
- The product does not operate normally when you follow the operating procedures.
- The main supply fuse(s) or any internal fuse(s) continually fail.

- A discharge of static electricity from contact with the human body or other conductor may damage system boards or static sensitive devices. Never perform internal maintenance without following recommended static protection procedures.
- The product is equipped with operator accessible fuses. If a fuse blows, it may be due to a power surge or failure of a component. Replace the fuse only once. If the fuse blows a second time, it is probably caused by failure of a component part. If this occurs, refer service to qualified service personnel. Always replace the fuse with one of the same rating, voltage, and type. Never replace the fuse with one of a higher current rating.
- When servicing the product, use only factory-specified parts.
- **WARNING**: When returning this product for service, or shipping this product to a second location, remove all hazardous specimens and decontaminate the product before packaging for shipment. If the product cannot be decontaminated, consult with your shipping agent on appropriate packaging and marking.

Obtaining service

Before contacting Advanced Instruments for Hot-Line® Service, be sure to read through this user's guide for instructions on routine adjustments, instrument care and troubleshooting. If this information does not solve your problem, call the appropriate number below.

- 800-225-4034 (toll-free within the USA and Canada)
- +US 781-320-9000 (elsewhere)
- 781-320-0811 (fax)

If you purchased your instrument outside of the U.S. or Canada, please contact your Advanced Instruments authorized dealer for service or repair.

When contacting our service personnel, please have the model and serial numbers from the label on the back of your instrument, your user's guide or service manual, and the symptoms of your problem ready. You should use a telephone as close to your instrument as possible to facilitate making recommended diagnostic checks. If you need to order parts or service, a purchase order from your purchasing agent will be necessary.

After Hot-Line diagnosis, your service technician may assist you in making minor repairs over the phone, dispatch a local service representative, or have you ship your instrument for factory repair.

If you need to return an instrument for repair or replacement:

- Notify our service department to obtain an RMA.
- Be sure to telephone Advanced Instruments before shipping to avoid any delays.
- Carefully pack and send everything except your instrument's supply items.
- Be sure to prepay for any shipment to the factory. Advanced Instruments cannot accept collect shipments without prior factory approval. Please insure the shipment or accept the damage risk.

Troubleshooting checks

Check operational requirements. If you are experiencing difficulties with your instrument, first carefully review the operational requirements listed in the product specifications and the recommended setup and operating procedures.

Check fuses. You will find the power switch and fuse holder beside the power cord connector on the back panel of the instrument. Switch the power switch to the off position and disconnect the power cord. Use a small flat-bladed screwdriver or similar tool to pry out the fuse holder. Visually check for a blown fuse. If there is any doubt, test the fuses with a continuity checker or ohmmeter or simply replace them with new fuses.

Check error messages. The software of your instrument is designed in such a way that any incomplete task will be associated with an error message, many self-explanatory, that will help you discover the source of your problem. You can find all error messages and descriptions of what they mean in Appendix B.

Internal diagnostics

The diagnostic menu allows any of a series of tests to be run to check one functional subsystem of the instrument, or to perform some necessary adjustment or set-up.

At "**Osmometer Ready**", the function keypads are respectively labeled **[CALIB]** and **[DIAG]** with the supervisor/operator keyswitch in the Supervisor position.

1. If necessary, press both soft keys simultaneously to display **[DIAG].**
2. When **[DIAG]** is displayed, press the function button under **[DIAG].** When you press the **[DIAG]** soft key, "**1. Recall Results**" and the choice of **[START]** or **[INDEX]** is displayed.
3. While any diagnostic menu item is being displayed, use either the

[START] soft key to start the displayed test; the **[INDEX]** soft key to display the next menu item; or both soft keys simultaneously to exit from the menu.

4. If you choose to press the **[START]** soft key, execution of the chosen function may require the use of either of the soft keys for further selections, as designated below. To end any function and return to the menu, press both soft keys and release them simultaneously.

5. You may then use **[INDEX]** to index to another item on the menu or press both soft keys and release them simultaneously to exit from the diagnostic menu to "**Osmometer Ready**".

Any instructions necessary for the menu function started are provided on the display. A description of each menu item follows:

A/D Test

This set of tests may be used to test the block probe, the sample-cooling assembly, or the sample probe.

On entry, the A/D tests display the target sample cooling block temperature, the channel being read, and the current channel reading or duty cycle. The display is in the form, "**off Blk NNNN.NN ohm**", where "**off**" indicates that a target temperature has not yet been selected, "**Blk**" indicates that the block probe channel is being tested, "**NNNN.NN**" is a numeric readout of the probe and "**ohms**" indicates the units of the readout. These readings are updated continuously.

Pressing the left function soft key sequentially changes the target cooling block temperature from "**off**" to "**+1**"°C, to "**0**"°C, to "**-1**"°C, to "**-2**"°C, to "**-4**"°C, to "**-8**"°C, to "**-12**"°C, to "**off**", etc.

Pressing the right function soft key sequentially changes the channel and readout units from probe resistance in ohms, to probe temperature in tenths of a degree Celsius, to cooling-block duty cycle ("**NN%**" on) to probe resistance in ohms, etc.

CAUTION

The temperature values displayed are based on the block probe resistance which the instrument is configured for. Thus, if the block probe bin # has been incorrectly set, both the displayed temperatures and resistances will be incorrect, as well as the actual temperature of the cooling block.

Press both soft keys and release them simultaneously to exit to the menu.

Probe Bin Test

This test is used to determine the resistance of the sample probe at a specific temperature. It is essentially the same as any other sample test except that the sample probe resistance and correct bin # are determined and displayed in place of the sample osmolality. Use the following procedure to run the test.

1. On entry, the probe bin test will display "**Probe Bin Test [YES] Ready? [CANCEL]**".
2. Press **[YES]** to start the test. When **[YES]** is pressed, the display changes to: "**Insert 50 mOsm Sample [CANCEL]**".
3. To continue, load a sample from a freshly-opened ampule of Advanced 50-mOsm standard and run the test using the sample test procedure detailed in Chapter 2.
4. "**Cooling Sample**" is displayed (as in a normal test), then the sample probe resistance in ohms is dynamically displayed as the sample is cooled. At the end of each test, the final display will be the test result in ohms and the sample probe bin # (e.g., "**5801.02 Ohms Bin 6**").
5. Record your results in the Service Log before running another test or canceling to the diagnostic menu.
6. Raise the operating cradle to complete the test.
7. When the operating cradle is raised, "**[YES] Ready? [CANCEL]**"

provides the opportunity to either run another 50-mOsm probe test or finish (cancel) the procedure. Run two more bin tests and average the results of the three to determine your bin number.

8. Press both soft keys and release them simultaneously (or press the **[CANCEL]** soft key) to exit to the menu.

Barcode Test

This test performs a continuous check of the barcode port.

1. Press the **START** key to enter the test.
2. At "**[YES] Ready? [CANCEL]**" you may press **YES** once the bar-code scanner is connected, or press **CANCEL** to return to the main menu.

   After you press **YES** you may begin scanning barcodes. If your code will not scan, check the manufacturers user's guide to verify correct setup of the scanner for your symbologies.
3. Press **CANCEL** or both keys to exit to the test menu.

Display/Print Test

This menu item is a simple check of the display, serial port and printer (if connected). On entry, a single line of characters will be displayed and sent to the serial and parallel ports. The characters displayed have been chosen to exercise every dot in the character matrix. This makes it possible to distinguish any dots that no longer work (on the printer, if connected, as well as on the display).

Press both soft keys and release them simultaneously to exit to the menu.

Beeper Test

This menu item exercises the beeper. On entry, this test displays "**[ON] Beeper [OFF]**". Press the **[ON]** soft key to cause the beeper to beep repeatedly; press the **[OFF]** soft key to stop the beeper.

Press both soft keys and release them simultaneously to exit to the menu.

Solenoid Test

This test is used to exercise the freeze pulse solenoid.

On entry into this test, press the **[IMPACT]** soft key for a single impact or the **[BUZZ]** soft key for a set of repeated impacts. If either or both of these do not occur when the appropriate soft key has been pressed, contact Advanced Instruments for Hot-Line Service.

Press both soft keys and release them simultaneously to exit to the menu.

Key Test

This menu item allows individually testing the switches in the soft keys. On entry, this test displays **[PRESS]** over each soft key. When each soft key is pressed the beeper should sound and an asterisk should appear above the pressed soft key to indicate proper operation.

Event Record

On entry, this menu item enables downloading the internally stored event record to both the serial and parallel ports. When ready, press **[YES]** to download.

Press **[CANCEL]** (or both soft keys and release them simultaneously) to exit to the menu.

Toggle the **[INDEX]** soft key to select another menu item or press both soft keys and release them simultaneously to exit from the diagnostic menu. As necessary on exit from the diagnostic menu, the power-up tests will automatically begin and should finish with the display, "**Osmometer Ready**".

Fuse replacement

If you determine that your instrument is not functioning because of blown fuses, you will need to replace the fuses using the following procedure.

1. Switch the power switch to the off position and disconnect the power cord.

2. Use a small flat-bladed screwdriver or similar tool to pry open the fuse holder door. Remove the fuse holder located inside.
3. Double-check the values marked on the fuses. The Model 3300 will automatically adjust for voltages between 100VAC and 250VAC but appropriately rated fuses must be installed. Use 5 × 20mm, 250V, time delay (Type T) fuses. For 100-130V operation, use 1.25-Amp fuses; for 200-250V operation use 1-Amp fuses.
4. Re-install the fuse holder into the back of the instrument and close the fuse holder door.
5. Re-connect the power cord and switch the power switch to the on position. The instrument should start up as normal.

Chamber cleaning

The cooling chamber and probe are easy to keep clean and dry by faithfully following the operating instructions for cleaning the freezing chamber after each test. If traces of standards or biological samples are left in the sample chamber, however, the task will be more difficult and damp cleaning will probably be required. Two indicators that damp cleaning may be required are:

- The instrument has been in use but no clean, dry chamber cleaner is found in the sample port and successive results on aliquots of the same sample indicate chamber contamination (the first aliquot read-

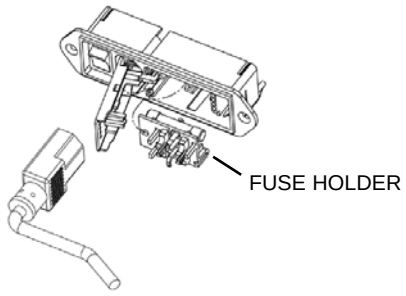


Figure 5: Fuse Replacement

ing very high and subsequent readings progressively lower).

- "Sample Pre-freeze" errors begin to occur quite frequently.

When indicated, the cooling chamber may be damp cleaned as follows.

1. Dampen (do not saturate) the end of a chamber cleaner with 70% isopropanol solution.
2. Firmly insert the dampened chamber cleaner all the way into the sample port, rotate it four or five times (clockwise and counter-clockwise) and withdraw.
3. Repeat with a dry chamber cleaner. Insert and leave a clean, dry chamber cleaner in the sample port until the next sample is to be tested.

Sampler plunger replacement and verification

To ensure proper instrument operation, you should replace the plunger tip of the sampler every 500 tests (or every package of sample cells).

To replace the plunger tip, use the following procedure.

1. Unscrew the calibration gauge and key.
2. Rotate the sampler shaft until the calibration setscrew appears beneath the access hole in the side of the sampler body.
3. Place the key end of the calibration gauge in the access hole and turn counter-clockwise to loosen the setscrew.
4. Carefully remove the old sampler plunger wire.
5. Place a sample tip on the sampler to help you place new wire correctly.
6. Slip the sampler plunger wire into the sample cell so the Teflon plunger tip protrudes about 1/16" or 1.6 mm from the end of the sample cell.
7. Using the key end of the calibration gauge, push the plunger into the

sampler as far as it will go.

8. Tighten the calibration setscrew with the calibration gauge.
9. Screw the calibration gauge and key back into the top of the sampler.

Your 20-µL sampler is now calibrated and ready to use.

For verification that the wire is calibrated correctly, use the following procedure.

1. Place a new sample tip on the sampler
2. Unscrew the calibration gauge and key.
3. Insert the key end of the calibration gauge into the sample tip.
4. Visually inspect the position of the end of the sampler plunger tip and the end of the calibration key. There should be no gap between the two.
5. If necessary, reset the sampler plunger wire as described above.

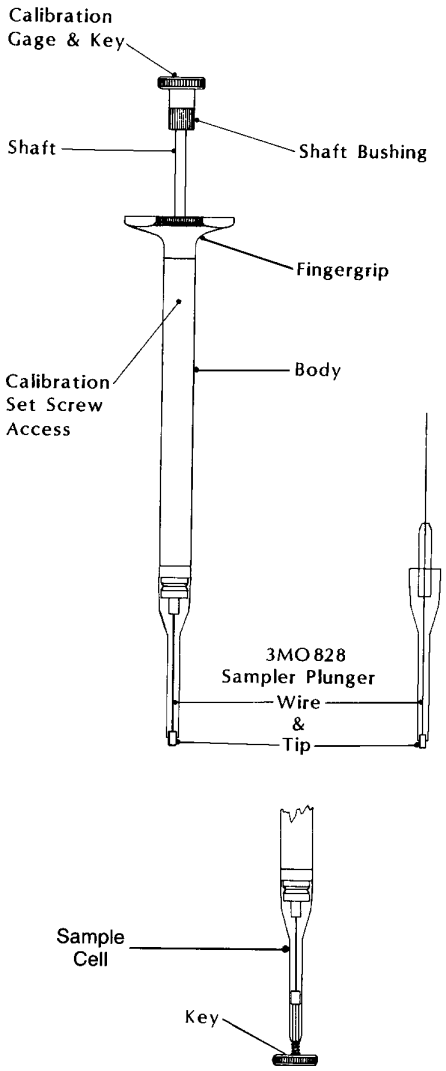


Figure 6: Sample Plunger Replacement and Calibration

Notes:

Appendix A

Troubleshooting Table

Problem/Message	Explanation
Abrupt loss of power	If you lose power to your instrument, we recommend that you check that your outlet is providing the correct amount of power. Check that your cord is firmly plugged into both the instrument and the outlet. Visually inspect the fuses, and change as necessary.
No response when sampler is lowered into operating position	If there is no response when you lower the operating cradle into operating position, there could be a problem with the internal switch that initiates the test. Try turning the instrument on and then off. If the problem persists, please consult an Advanced Instruments Model 3300 Service Manual or contact Advanced Instruments for Hot-Line Service.
Results not repeatable (too scattered)	Most often, poor repeatability comes as a result of poor technique or not following procedure. Be sure all sample tips are clean, as well as the sampler itself. If the sampler plunger wire has not been changed in 500 tests, change it as described in Chapter 4. If the sampler is not properly calibrated, re-calibrate it using the procedure described in Chapter 4.
“Block Probe Failure”	This message indicates a problem with your block probe. Contact Advanced Instruments for Hot-Line Service.

"Block Probe Open?"	This message indicates a problem with your block probe. Check the block probe bin number and change if necessary. If this does not solve your problem, contact Advanced Instruments for Hot-Line Service.
"Calibration out of Range; Repeat Calib"	This message indicates that your calibration could not be accepted because the results were not consistent enough. Retry the calibration, paying particular attention to technique.
"Cooling System Error"	This message indicates that your cooling system is not functioning properly. Contact Advanced Instruments for Hot-Line Service.
"Event Record Lost"	This message indicates that the event record stored in memory has been corrupted. Try restarting your instrument. If this does not solve your problem, Contact Advanced Instruments to obtain Hot-Line Service.
"Fan Driver Failure"	Try restarting your instrument. If this does not solve your problem, contact Advanced Instruments for Hot-Line Service.
"Key Input Timeout"	This message is caused either by a button being pressed continuously or a keypad malfunction. Restart your instrument, and if the problem persists, contact Advanced Instruments for Hot-Line Service.
"Lift Operating Cradle"	Raise the operating cradle to a positive stop. Restart your instrument if necessary. If this does not solve your problem, contact Advanced Instruments for Hot-Line Service.

“Lift Operating Cradle” “Clean Sample Chamber”	This message, along with audible beeps, indicates the test sample was left in the sample chamber for an extended period. Lift cradle, remove sample, and clean chamber. The final result will appear only for 10 seconds once you lift the cradle.
“No Plateau Detected...”	Your instrument was unable to detect a freezing plateau, and was therefore unable to give a result. Check your technique and try again. If the message persists, obtain Hot-Line Service.
“Parameter RAM Failed or New Software Version”	This informative message tells you that a new software version has been installed since you last powered the instrument or that the information stored in parameter RAM has been corrupted. The instrument will reload factory defaults..
“Recalibration Needed”	This message indicates that you need to re-calibrate your instrument. Re-calibrate closely following the instructions in Chapter 3. If the error message repeats after successful re-calibration, obtain Hot-Line Service.
“Reset Probe Config.”	Most likely, this message indicates that you should reset your block and sample probe bin numbers as described in Chapter 4. If this does not solve the problem, contact Advanced Instruments for Hot-Line Service.
“Result = 0, Bad Calibration?”	Unless you are running a sample of distilled water or some other fluid with an osmolality of zero, you should not see this message. If you were expecting a sample to test above zero, then you may need to re-calibrate your instrument.

"ROM Serial Number Error"	Try restarting your instrument. If this does not solve your problem, contact Advanced Instruments for Hot-Line Service.
"Sample Freeze Error..."	This message can be displayed for a number of reasons. Check your technique and the condition of your sampler. If neither of these is the source of the problem, you should check your sample and block probe numbers. If this does not solve your problem, contact Advanced Instruments for Hot-Line Service.
"Sample Pre-freeze..."	A sample pre freeze message usually appears as a result of an unclean freezing chamber. Clean your chamber as described in Chapter 4, and be sure that the chamber is cleaned after each test. If this does not solve your problem, you should check the probe bin number and obtain service if necessary.
"Sample Probe Failure"	Switch the instrument off, then on. Check the sample probe by running the A/D tests. If the error message does not persist and other error messages are not displayed, ignore this message. Otherwise, contact Advanced Instruments for Hot-Line Service.
"Sample Probe Open?"	Switch the instrument off, then on. Check the sample probe by running the A/D tests. If the error message does not persist and other error messages are not displayed, ignore this message. Otherwise, contact Advanced Instruments for Hot-Line Service.

“Set Probe Bin #'s”	Your instrument will not function unless there are bin numbers entered for both the block and sample probes. To set these numbers, see instructions in Chapter 4.
“Sample Did Not Freeze...”	If you heard an impact while the sample was attempting to run, the fault most likely lies with the sample preparation or the block probe. Run another test, paying close attention to technique. If your problem is not resolved, check and correct if necessary the block and probe bin numbers.If you heard no impact, the problem most likely lies with the solenoid impactor. Retry the test, and, if necessary, contact Advanced Instruments for Hot-Line Service.
“Solenoid Driver Failure”	This message indicates a problem with your solenoid impactor. Try restarting your instrument. If this does not solve your problem, contact Advanced Instruments for Hot-Line Service.
“Standards Reversed? Please Repeat...”	This message will appear during the calibration procedure if the instrument detects that the low and high calibration standards may have been mixed up and were entered in the wrong order. Retry the calibration, being sure that the standards are correct.
“System Error: Reqs” “System Error: Prim” “System Error: Comm” “System Error: Unkn” “System Error: Trap”	Each of these error messages indicate a different system error. Try restarting your instrument. If this does not solve your problem, contact Advanced Instruments for Hot-Line Service.

"T E Driver Failure"	This error message indicates a problem with your thermoelectrics. Try restarting your instrument. If this does not solve your problem, contact Advanced Instruments for Hot-Line Service.
"Test Time-out Error"	This message indicates that your instrument was unable to complete the test in the allotted time. Be sure that your operator technique is sound and retry the test. If the problem persists, check your block probe number. If you need more assistance call for Hot-Line Service.

Appendix B
Product Specifications

Electrical	
Power Requirement:	100 to 130 VAC (50-60 Hz) or 200 to 250 VAC (50-60 Hz)
Fuses (2):	250V time delay (Type T): 1.25-Amp (100-130 VAC); 1-Amp (200-250 VAC)
Power Consumption:	60 Watts
Memory Backup:	Integral lithium cell; 10-year life (typical); (not user-replaceable)
Sample Volume:	20 µL
Sample Capacity:	Single sample
Readout:	2 line by 24-character vacuum fluorescent display
Units:	mOsm/kg H_2O
Range:	0 to 2000 mOsm/kg H_2O
Resolution:	1 mOsm/kg H_2O
Communications:	DTE EIA-232/V.24 (RS-232); serial port, parallel printer port and optional barcode scanner
Performance at Reference Conditions[1]	
Linearity:	Less than ±1% from a straight line between 0 and 850 mOsm/kg H_2O; less than ±1.5% above 850 mOsm/kg H_2O
Repeatability	
0 to 400 mOsm:	±2 mOsm/kg (1 S.D.)
400 to 2000 mOsm:	±0.5% (1 S.D.)
Drift:	Less than 1 mOsm/kg H_2O per month
Performance Over Operating Conditions	
Temperature Effects:	Less than 1 mOsm/kg H_2O for every 5°C (9°F) ambient temperature change

[1]Reference Conditions: 20°C to 25°C (68°F to 77°F); 40% to 60% Relative Humidity; tolerances of reference or calibration solutions excluded.

Operating Conditions	
Temperature:	18°C to 35°C (64°F to 95°F)
Humidity:	5 to 80% relative humidity (non-condensing)
Storage Temp.:	-40°C to +45°C (-40°F to +113°F)
Start-up Time:	30 seconds from power-on
Test Time:	60 seconds
Dimensions	inches centimeters
Width:	10.5 26.7
Depth:	13.0 33.0
Height:	15.5 39.4
Weight	pounds kilograms
Net:	16.0 7.3
Shipping:	25.0 11.4
Warranty:	One-year limited warranty on workmanship and all parts except glass, plastic, and parts warranted by their makers
Certification:	Intertek 98214 Refer to Regulatory Notices (Appendix C) for applicable standards
Installation Class:	I
Over-Voltage Category:	II
Pollution Degree:	2
Moisture Protection:	IPX0 (ordinary)

Appendix C
Regulatory Notices

- This product has been designed and manufactured in accordance with U.S., Canadian, and European regulatory requirements as outlined below. Modifications made to this product that are not expressly approved in writing by the manufacturer will void the user's authority to operate this product, previously issued factory approvals, and the user's rights under the warranty.
- The distributor or dealer may have applied additional local, national, or international approvals to this product. Consult the distributor or dealer for more information and documentation.
- Connections to this product must be made with shielded cables. Use of non-shielded cables may violate RFI/EMI limits.

Symbol Conventions

CE This symbol indicates conformity to relevant European directives.

This symbol indicates the product was tested to conform to relevant Canadian and U.S. safety standards by Intertek Testing Services NA, Inc. The ETL mark is approved in the United States as a Nationally Recognized Testing Lab (NRTL) by OSHA, and in Canada by the Standards Council of Canada.

IVD *In Vitro* Diagnostic Medical Device complying with EU Directive 98/79/EC.

Regulatory approval type	Description
U.S. Safety	This product has been listed by ETL testing laboratories as being in compliance with the requirements of UL 3101-1, 1st Edition, "Electrical Equipment for Laboratory Use; Part 1: General Requirements". The "US" in the lower right of the ETL mark demonstrates this listing.
Canadian Safety	This product has been listed by ETL testing laboratories as being in compliance with the requirements of CAN/CSA C22.2 No.1010.1-92, "Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use; General Requirements"; Including Amendment Two. The "C" in the lower left of the ETL mark demonstrates this listing.
EC Declaration of Conformity - EMC	This product meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated using the following standards, as listed in the Official Journal of the European Communities: Consult the Declaration of Conformance certificate shipped with the product for the latest update. ・ EN 61326: 1998, Group 1, Class B, "Electrical Equipment for Measurement, Control, and Laboratory Use".
EC Declaration of: Conformity - Low Voltage	This product meets the intent of Directive 73/23/EEC, the Low Voltage Directive. Compliance was demonstrated using the following standards as listed in the Official Journal of the European Communities: Consult the Declaration of Conformance certificate shipped with the product (if required) for the latest update. ・ EN 61010-1 (1993), "Safety Requirements for Electrical Equipment for Measurement,Control and Laboratory Use - General Requirements"; Including Amendment Two (1995).

Regulatory approval type	Description
EC Declaration of Conformity - IVD	This product meets the intent of Directive 98/79/EC for In Vitro Diagnostic Medical Devices. Consult the Declaration of Conformance certificate shipped with the product (if required) for the latest update.

Notes:

Appendix D
Warranty & Warranty Duties

LIMITED
WARRANTY
CONDITIONS

MODEL NUMBER: _____
SERIAL NUMBER: _____
INSTALLATION DATE: _____

Advanced Instruments warrants that for 12 months from date of shipment, each new product sold or manufactured is free from defects in material and workmanship under normal installation, use and service except glass, plastic and parts warranted by their makers.

Advanced Instruments agrees that such defects will be remedied or new parts furnished in exchange for any defective part delivered by the owner, transportation charges prepaid, to the factory for our examination. If, in our judgment, the part contains any such defect it will be replaced, charging only for transportation.

This warranty does not extend to any instrument subjected to negligence, accident, abuse, misuse or other improper operation, or which has been tampered with, altered or repaired by anyone other than Advanced Instruments or its authorized service representatives. Nor does this warranty extend to any consequential damages caused by defects or improper use, or secondary damage resulting from prior problems.

The above provisions do not extend the original warranty period of any instrument or part thereof which has been replaced or repaired thereunder.

Remedies made under the terms of this warranty in no case include any obligation or responsibility for transportation charges or arrangements.

All results, calibrations, effectiveness, medical diagnoses and interpretations are the responsibility of the user.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, REPRESENTATIONS AND CONDITIONS OF ANY KIND, EXPRESSED OR IMPLIED IN FACT OR BY LAW. IN NO EVENT SHALL ADVANCED INSTRUMENTS BE LIABLE UNDER THIS WARRANTY OR OTHERWISE IN ANY MATTER FOR ANY REMOTE OR CONSEQUENTIAL DAMAGES RESULTING FROM THE BREACH OF THIS WARRANTY OR CONDITION IMPLIED BY LAW OR OTHERWISE. OR FOR ANY DAMAGE TO THE INSTRUMENT OR ANY PART THEREOF CAUSED BY IMPROPER INSTALLATION, UNAUTHORIZED REPAIR OR ALTERATION, NEGLIGENCE, ABUSE OR MISUSE INCLUDING USE OF IMPROPER GLASSWARE OR REAGENTS, ACCIDENT, OR ACT OF GOD.

Attention is called to the user's responsibility regarding reasonable use, useful life of the instrument and immediate notification of accident outlined in the warranty duties section of the user's guide and/or service manual.

No person is authorized to assume for us any other liability in connection with the sale or service of this equipment.

Advanced Instruments reserves the right, at any time without notice, to make changes in price, color, material, specifications and models without incurring liability to modify products previously produced, and to add or discontinue models and accessories.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

AI1YW REV 0

By accepting and operating this instrument, the user and Advanced Instruments agree to the following responsibilities which constitute contractual warranties and conditions between the seller and the user for the maximum benefit and usefulness of the instrument.

ADVANCED INSTRUMENTS WARRANTS THAT IT:

1. Has produced equipment equal to or exceeding that of any competitive product in the same price range in standards of design, material and workmanship.

2. Knows of no defects in design or materials which may cause bodily injury.
3. Will endeavor to advise the user of changes or improvements in the instrument as they are developed, so that the user may take steps to improve the safety and performance of his equipment throughout its useful life.
4. Will replace or repair equipment according to the guarantee on the attached warranty.
5. Will cooperate closely in common defense of any accident involving this equipment, or third-party suit against the user or operating personnel, if advised immediately by the user of the occurrence of any accident.

THE USER WARRANTS THAT:

1. The instrument will be used reasonably.
2. The instrument will be regularly maintained according to this manual, including a log of all service, tests and repairs performed on the equipment, and records will be kept of all requests for repair made to Advanced Instruments where such repairs were beyond the ability of local service personnel.
3. The instrument will not be altered without written approval from Advanced Instruments.
4. Advanced Instruments will be notified immediately if any injury occurs in any association with the instrument and will be allowed prompt and thorough examination of the instrument in question.
5. Advanced Instruments will be held harmless in cases of injury arising (see definitions below):
    a. Beyond the useful life of the equipment.
    b. From unreasonable use.
    c. When Advanced Instruments is not immediately notified of said injury.
    d. From interpretation of results.

DEFINITIONS

1. "Useful life" is:
    a. The same as the depreciation life in the Internal Revenue Service guidelines, whether or not the user actually depreciates the instrument, but not to exceed 10 years from date of delivery to the user.
    b. Only during the time the equipment has been maintained on a regular basis as prescribed by Advanced Instruments. If the user is in an area which has no local service, Advanced Instruments may require a local service person (understood to mean the person actually performing the "hands-on" service of the equipment) to attend and pass a reasonable maintenance and repair course.
    c. Only during the time when the user has not altered the equipment in any way without written approval from Advanced Instruments.

d. Only during the time when the user has not loaned, leased or resold the equipment to any third party.

2. "Reasonable use" is use:

a. According to the instructions supplied by Advanced Instruments (assuming English-reading personnel or supervision). If neither the supervisor nor the operator reads English, the user agrees to obtain accurate translations of the instrument labels, instructions, user's guides and/or manuals provided.

b. Under direct, on-the-job supervision of the supervisor or other professional in charge.

c. In which there are no known defects or uncorrected repairs.

d. Only for the purpose stated in the instructions provided with the instrument.

e. In which the equipment has been maintained according to the instructions provided.

3. "Immediate notification" is:

a. Recognition that time is of the essence when any accident, malpractice or product liability arises which involves Advanced Instruments equipment.

b. Notification to Advanced Instruments immediately (the same day, if possible) in the event of injury to any person in circumstances involving Advanced Instruments equipment in which Advanced Instruments might be named as a defendant in any form of litigation.

c. Allowing Advanced Instruments or its representatives, immediate, full, and thorough examination of Advanced Instruments equipment, and all records pertaining to such equipment.

Notes:

Appendix E

Supplemental RS-232 Information

The DB-9 RS-232 port on your instrument conforms to the DTE EIA-232 standard and can reliably communicate over shielded cable up to 10 meters in length, depending on the baud rate you use. Almost every item of information displayed by your instrument is also transmitted over the RS-232 port, including test results, all error messages, and most display data from the diagnostic menu.

Data is transmitted asynchronously as 1 start bit, 8 data bits and 1 stop bit, with no parity. Each message transmitted from the communication port is terminated by the sequence, Carriage Return (0D Hex), Line Feed (0A Hex). Note that your instrument is only capable of outputting information. At this time, there is no protocol for talking to the instrument.

Sample RS-232 Setup

As a typical example of a communications program setup, the following instructions will describe the process necessary for using your instrument in conjunction with Hyperterminal for Windows® 95 or later operating systems and a null modem cable, available from Advanced Instruments, as shown in the diagram below. You can use this procedure to be sure that your instrument and cable are operating correctly.

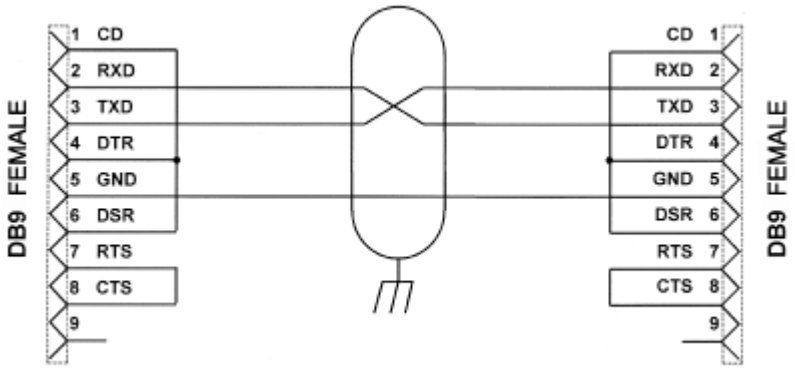
1. Create a Hyperterminal connection using the Hyperterminal program.
2. While working within that connection, choose the Properties selection from the File menu.

3. Select the Configure button.
4. Choose the following settings for the Configure menu and click on the OK button.

Bits per second	See user's guide.
Data bits	8
Parity	None
Stop bits	1
Flow control	None

5. Select the Settings menu.
6. Chose TTY for the Emulation option.
7. Select ASCII setup.
8. Set the Sending option to Echo Typed Characters Locally.
9. Set the Receiving option to Wrap Lines that Exceed Terminal Width.

You should at this point see all instrument output in the Hyperterminal window of your computer screen.



Null Modem Cable

Shield connects to metalized connector housing at both ends.

Appendix F

Symbol Definitions

	On-Off		Functional Arrow
	Feed		Printer
	Interrupt		Enter
	Test		RS232
	Start		Bar Code
	Stop		Attention
	Record Review		Caution Hot Surface
	Setup		Dangerous Voltage
	Calibration		Lifting Hazard
	Cancel; Delete	CAL	Calibrator

CONT	Content		Do Not Open Top
CONTROL	Control	HANDLE WITH CARE	Handle With Care
CONTROL –	Negative Control		Toxic
CONTROL +	Positive Control	USE BLADE TO OPEN	Use Blade To Open
	Flammable		Do Not Re-Use
	Fragile	IVD	For *In Vitro* Diagnostic Use
	Irritant	CE	European Conformity
	Keep Dry		Temperature Limit
	Date Manufactured		See Instructions
STERILE	Sterile	LOT	Lot Number
NON STERILE	Non-Sterile		Use By; Expiration Date
SN	Serial Number	EC REP	Authorized Representative
SOLN	Solution	REF	Part Number

	Sufficient for [x] Tests		Latex-Free
	Open Here		Diluent
	Low Fluid Level		See Instructions for Temperature Guidelines
	Keep Hands Clear		Potential Puncture Hazard
	Manufacturer		

Notes:

Appendix G

Service Log

Model: 3300
Serial Number:
Software Revision:
Sample Probe Number:
Block Probe Number:

Date	Problem/Symptom	Action

Date	Problem/Symptom	Action

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